**Date\_\_\_\_\_\_\_ Time 7:20 Subject Homeostasis & Cell Membrane Grade10**

**Pennsylvania/National Standards:**

* Keystone Anchor
  + BIO.A.2.2: Describe and interpret relationships between structure and function at various levels of biochemical organization (i.e. atoms, molecules, and macromolecules)
* PDE SAS
  + S11.A.3.2.3 Describe how relationships represented in models are used to explain scientific or technological concepts (e.g., dimensions of the solar system, life spans, size of atomic particles, topographic maps).
  + S11.B.1.1.1: Explain how structure determines function at multiple levels of organization (e.g., chemical, cellular, anatomical).
  + S11.B.1.1.3: Compare and contrast cellular processes (e.g., photosynthesis and respiration, meiosis and mitosis, protein synthesis and DNA replication).
  + S11.A.1.3.2: Describe or interpret dynamic changes to stable systems (e.g., chemical reactions, human body, food webs, tectonics, homeostasis).
* National Science Education Standards
  + Standard C 1.1: Cells have particular structures that underlie their functions. Every cell is surrounded by a membrane that separates it from the outside world. Inside the cell is a concentrated mixture of thousands of different molecules which form a variety of specialized structures that carry out such cell functions as energy production, transport of molecules, waste disposal, synthesis of new molecules, and the storage of genetic material.

**Essential Understanding(s)/Key Concepts/Skills:**

* Homeostasis allows cells to maintain proper concentration of nutrients and water and eliminate wastes.
* Different types of cell transport, including active and passive transport, help maintain homeostasis.
* Homeostasis is important at the cellular level as well as the levels of organ systems and organisms.
* The human body can use positive and negative feedback controls to maintain homeostasis.

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| **Instructional Objectives** | **Aligned Assessments** |
| 1. Given a writing prompt, the student will explain the importance of homeostasis and the processes involved with maintaining homeostasis in human cells with 80% accuracy  2. Given an assignment worksheet, the student will identify the different types of cell transport with 80% accuracy. | 1. Mid-term exam question  2. Cell transport mock court case assignment, Mid-term exam questions |

**Review of Skills/Content:**

The information learned in the previous lessons regarding the cell membrane and cell transport methods may be reviewed before this lesson. Students will need to recall the information they learned about the structure of the cell membrane and its functions as well as the different methods of transport through the cell membrane.

**Materials:**

* Homeostasis PowerPoint notes presentation
* Homeostasis PowerPoint notes student handouts
* Videos:
  + <http://youtu.be/dPKvHrD1eS4>
  + <http://youtu.be/d2YWonZsh_M>
  + <http://youtu.be/zIBasjiZd5U>
* Cell transport mock court case activity handouts
* Teacher computer with projection system

**Behavioral Expectations:**

Students will be expected to follow all posted school and classroom rules. Students will be expected to pay attention to the teacher and respect the teacher and classmates at all times. Since the students will be working in groups, they will be expected to actively participate in group work while maintaining focus and staying on-task. Students will be expected to actively take notes during the PowerPoint presentation and to actively pay attention during the videos.

**Methods of Assessment:**

The lesson objectives will be formatively assessed during the lesson through the use of informal questioning. At the end of the lesson, the teacher will do a visual check for completion of the students’ note handouts. There will also be questions regarding the information learned in this lesson on the unit exam. The cell transport mock court case activity sheets will be collected upon completion of the activity and assessed by the teacher.

**General/Specific Accommodations for Students (Diverse/English Language Learners):**

In order to accommodate English language learners and students with special needs, access to classroom aides such as textbooks will be provided so students may look up words they are unfamiliar with. The instruction will be delivered clearly and concisely. Responses to questions may be modeled and extra time may be given to complete assignments. Students will be allowed to work in groups and may be allowed to hand in a single activity sheet for the entire group if permitted by the teacher. The activity handouts and notes will be read aloud to aid students with visual impairments and copies of pre-filled note sheets may be provided if necessary.

**Instructional Sequence:**

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| **Lesson Implementation** | **Anticipated Student Responses** |
| **Introductory Activity (Anticipatory Set):**  The anticipatory set will include a set of Keystone exam vocabulary words that relate to the lesson including homeostasis, negative feedback control, and positive feedback control. The students will be given approximately 10 minutes to define these terms by looking up the definition in their textbooks.  The class will then review the daily objectives which will be written on the board. | Once the students arrive in the classroom, they will be expected to sit down, take out their books and notebooks, copy down the vocabulary words, and write definitions for them in their notebooks.  The students may not begin to work on their vocabulary right away, so it will be important for the teacher to keep them on task. |
| **Modeling/Demonstration:**  To begin the modeling/demonstration, the teacher will gain the students’ attention asking them what they remember from the unit so far. The teacher will then show a video that will review the cell membrane and the processes of cell transport that the students have already gone over throughout the unit. (<http://youtu.be/dPKvHrD1eS4>)  After the students have viewed the video, the teacher will introduce the idea of homeostasis and its importance to the cells and to the body as a whole. The teacher will then pass out guided note handouts and start the notes PowerPoint. The PowerPoint will review important features of the cell membrane and cell transport and introduce the students to the concept of homeostasis in the cells and the human body. The teacher will demonstrate how the students will identify the missing words from their handouts and insert the proper terms from the PowerPoint presentation slides. | During the modeling/demonstration, it is expected that the students will follow the instruction and pay attention to the instructor. Some students may lack attention so it will be important for the instructor to make sure to maintain student focus during this time.  The students should copy all of the PowerPoint notes onto their notes sheets. Depending on the level of the students and based on teacher discretion, the teacher may perform a notebook check in order to make sure the students have copied down all of the required information.  Some students may not participate in note-taking and may not maintain focus on the PowerPoint. The teacher should try to keep the students focused by making the notes interesting. |
| **Guided Practice/Feedback:**  The students will continue to follow along with the notes presentation and fill in the required areas on their notes handouts while the teacher checks their work during the presentation.  Once the students have finished copying the PowerPoint notes, the teacher may (time-permitting) show two short videos (<http://youtu.be/d2YWonZsh_M>) and (<http://youtu.be/zIBasjiZd5U>) in order to reinforce some of the ideas presented in the PowerPoint presentation.  The teacher will then hand out the cell transport mock court cases to the students and review the instructions. Once the teacher has gone over what the students will be doing, the class will work together in order to solve the first example.  Once the students complete the first example as a class, they will be broken into groups of 4 for the rest of the activity. | The students should fully participate in the guided practice and to use the feedback provided by the teacher to guide their learning and help them understand the concepts being taught.  The students may not actively pay attention to the videos, so the teacher will have to orbit the room to make sure the students are watching and paying attention.  Some students may not participate in the discussions, so it will be important for the teacher to elicit responses by asking students who agree with the statements other students made to raise their hand or some other form of response.  Moving the students into groups could cause some of them to get off-task. The teacher will have to closely monitor the students during this time to ensure a smooth transition. |
| **Independent Practice:**  Once the students are separated into their groups, they will be asked to work together following the instructions on their handouts in order to complete the activity. The students will be working as a group, but they will be required to turn in individual sheets for formative evaluation by the teacher. If the students finish before the end of class, they will turn in their activity handouts. If they do not finish in time, they will complete their activity handouts on their own at home. These will be collected the next day. | The students will be expected to participate fully in the activity with the members of their group.  Some students may not want to participate in the activity. The teacher will have to make sure all students are participating equally and sharing ideas. |
| **Discussion/Essential Questions:**   * What is homeostasis? * How does the cell membrane and cell transport help maintain homeostasis? * Why is it important for the body to maintain homeostasis? | The students should be able to answer these essential questions by the end of the lesson. |
| **Formative Assessment:**  The formative assessment for this lesson will consist of the students’ answers to informal questioning throughout the lesson as well as their completed activity handout which they will turn in at the end of the period or the start of the next period. The information gained from these assessments will allow the teacher to make sure students understand the key concepts being covered in the lesson and adapt future lessons. |  |
| **Closure (Review/Preview):**  To close this lesson, the teacher will lead a short class discussion based on the essential questions for this lesson. The teacher will ask the students what homeostasis is, how the cell membrane maintains homeostasis, and why it is important to maintain homeostasis in cells and in the body. | The students should participate in the discussion and should provide their own unique input. They should also think critically about the information they learned over the course of the unit so far. Some students may not participate, so the teacher should guide them into discussion by asking if they agree or disagree with other students. |
| **Extension Activities:**  The extension activity that will be used if the lesson is finished before the end of the period will consist of giving the students pieces of paper and asking them to create vocabulary flash cards for the terms covered in the lesson and then review them with their partners. The students may also be asked to look over the review pages in their textbooks regarding the concepts that were taught during this lesson and the unit up to this point. | The students should maintain focus while completing this activity, but some may lose focus since the period will be almost over. The teacher will need to help maintain student focus. |

**Correction Procedures/Potential Areas of Difficulty:**

Some students may have trouble understanding how the cell membrane and cell transport methods relate to maintaining homeostasis in cells and the body. It will be important to make sure the teacher emphasizes the importance of the cell’s selectively permeable membrane, the receptor and transport proteins in the cell membrane and their relationship to helping the cell maintain homeostasis and helping the body maintain homeostasis.

**Summative Assessment:**

**Assessment Items**

1. The term used to describe the ability of a living organism to adjust to changing environmental conditions by regulating their internal processes is
   1. Regulation
   2. Homeostasis
   3. Metabolism
   4. Feedback
2. What structure composed mainly of proteins and lipids aids in maintaining homeostasis in the cell?
   1. Cell membrane
   2. Centromere
   3. Endoplasmic reticulum
   4. Cell wall
3. Describe the importance of homeostasis in human cells. Include and explain at least one specific example of how cells in the body help maintain homeostasis.

**Answers and Scoring Criteria**

1. B (1 point)
2. A (1 point)
3. (3 points total). 1 point for identifying the importance of homeostasis (homeostasis maintains stable internal conditions for cells), 1 point for providing an example (such as cells excreting waste products or osmosis helping to maintain water balance), and 1 point for explaining the specific importance of that example (excretion removes hazardous waste which could damage the cell, regulation of water through osmosis prevents the cell from bursting or shriveling)

**Modified Assessment Items for Students with Disabilities and English Language Learners:**

1. Maintaining a balance or steady state in cells is called\_\_\_\_\_\_\_\_\_\_\_\_\_
   1. Regulation
   2. Homeostasis
   3. Metabolism
   4. Feedback
2. What structure composed mainly of proteins and lipids helps **maintain homeostasis** in the cell?
   1. Cell membrane
   2. Centromere
   3. Endoplasmic reticulum
   4. Cell wall
3. **Describe** the importance of homeostasis in the human body. Include **at least one specific example** of how cells or organ systems in the body help maintain homeostasis.

**Reflections:**

**Sources:**

Miller, K. R., & Levine, J. S. (2010). *Miller & Levine biology*. Boston, Mass.: Pearson.